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Better methods of potato production for Iowa: Results of three years' investigations at Iowa Agricultural Experiment Station

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BETTER POTATO PRODUCTION METHODS FOR IOWA

AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS

Horticultural Section

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CONTENTS.

SUMMARY.

Spraying potatoes for early blight proved profitable each year during three seasons of experimentation. Three sprayings increased the net income per acre $3.20; five sprayings, $8.92; seven sprayings, $16.46 per acre.

About thirty different varieties of early and late potatoes were tested during each of the three years. Of the early varieties Irish Cobbler and Early Ohio gave the best yields; of the later varieties Prosperity and Rural New Yorker gave the highest yields.

The importance of seed selection was demonstrated by selecting high yielding hills in the field. The yield was increased 50 bushels of marketable tubers per acre by selecting the best hills as compared with the poorest hills. In selecting the best hills from both of these lots the following year the seed which had high yielding characters behind it still outyielded the poorer lot by 50 bushels of marketable tubers.

Planting late in April gave the highest yield in 1910. Plantings on May 16 and May 23 gave the highest yields in 1911 and 1912.

BETTER METHODS OF POTATO PRODUCTION FOR IOWA

Results of Three Years' Investigations at Iowa Agricultural Experiment Station

BY LAURENZ GREENE AND T. J. MANEY.

In 1910, when the potato investigations reported in this bulletin were begun, Iowa stood seventh as a potato producing state with an average yield of 82 bushels per acre. The two states ranking first and second had at that time an average yield of 225 and 200 bushels per acre respectively. This indicated that Iowa's production was too low and experiments were planned to investigate the causes and to determine what better methods of production might be used to raise the average yield per acre.

This bulletin gives a report upon the results obtained during the years 1910, 1911 and 1912 from:

1. Spraying experiments.
2. Variety tests.
3. Selection of best hills as a means of increasing yield.
4. A comparison of different planting dates as they influence the yield of the main or late crop of potatoes.

Other lines of work already under way will be continued and reported upon later under the direction of A. T. Erwin, who is now in charge of the Iowa Agricultural Experiment Station investigations in truck crops.

SPRAYING.

According to notes kept from 1882 to 1908 by Dr. L. H. Pammel of the botany section of the Iowa Agricultural Experiment station, early blight, *macrosporium solani,* occurred in Iowa in 1892, 1894, 1895, 1901, 1905, 1906, 1907, and 1908. The late blight, *phytophthora infestans,* the disease which causes the rot of potatoes, is hardly considered of economic importance in this state. The records show that it occurred only in the seasons of 1885, 1886, and 1903. The records of the attacks of 1885 and 1886 were questionable, while the one of 1903 was rather severe. Since 1903 the disease has not appeared except locally.

The spraying experiments which were conducted during the seasons of 1910, 1911, and 1912 were planned with the idea of

controlling the early blight. In 1910 duplicate plots of 1-10 acre each were planted and sprayed three, four or six times, respectively, with bordeaux mixture 5:5:50 and 2 pounds of lead arsenate. The check plots were sprayed with lead arsenate alone, in order to control insect pests. The sprays were applied at a pressure of 75 to 100 pounds with a Brown combination grape and potato sprayer.

TABLE I. SPRAYING TESTS 1910.

Yield of Tubers in Bushels Per Acre.

No. of Sprays	Dates of Application	Total	Market.	Culls	Per cent increase over check	
					Total	Market.
Check, lead arsenate only	July 7-28 Aug. 11	95.5	90.1	5.4		
3	July 7-28 Aug. 11	115.8	108.0	7.8	21.2	19.8
4	July 7-21 Aug. 4-18	138.1	129.0	9.1	44.6	43.1
6	July 7-21-28 Aug. 4-11-18	160.0	151.6	8.4	67.5	68.2

TABLE II. SPRAYING TESTS 1911.

Yield of Tubers in Bushels Per Acre.

Check, lead arsenate only	June 12-21 July 12-31	74.80	66.90	7.90		
3	June 12 July 17 Aug. 14	97.24	87.91	9.33	30	31.2
5	June 12-20-23 July 31 Aug. 14	109.68	103.84	5.84	46.6	55.2
7	June 12-20-26 July 17-31 Aug. 14-28	111.12	101.47	9.65	48.5	51.7

In these tests the spraying had a marked effect on the increase in yield and they were profitable.

In 1910 the early blight was quite severe. The check plots were badly damaged, while the plots receiving the bordeaux treatments were only very slightly affected. The plots receiving the six applications were green up to digging time and yielded 61.5 bushels more marketable tubers to the acre than the check plots.

TABLE III. SPRAYING TESTS 1912.

Yield of Tubers in Bushels Per Acre.

No of Applications	Dates of Application	Total	Market.	Culls.	Per cent increase over check	
					Total	Market.
Check, lead arsenate only-	June 10-18 ------ July 5-19 -------	98.8	95.0	3.8	--------	--------
3 ----------	June 18 ---------- July 5-19---------	101.0	91.5	9.5	2.2	-3.6
5 ----------	June 18 ---------- July 5-19 -------- Aug. 2-16 -------	104.4	96.1	8.3	5.7	1.1
7 ----------	June 19 ---------- July 5-19 -------- Aug. 2-16-30 ----	136.2	128.6	7.6	37.8	35.3
Lime sulphur ----------	June 18 ---------- July 5-19 -------- Aug. 2-16 ------	116.1	108.5	7.6	17.5	14.2

In 1911 the plan of spraying tests was changed from 3, 4, and 6 to 3, 5, and 7 applications on duplicate plots of 1-10 acre each.

In 1911 the early blight was not so prevalent as in 1910 or 1912, but here again we have evidence which shows the beneficial effect of bordeaux in controlling the disease and thus prolonging the growing period of the vines. Attention is called to the fact that in these tests the plots which received five applications yielded about the same as those sprayed seven times. This may be due to the fact that the early blight was not so severe in 1911 as in 1910.

In 1912, on account of lack of available space, the plots under experiment were reduced from duplicate 1-10th acre to duplicate 1-20th acre plots. During this year, in addition to spraying with bordeaux mixture, two plots were sprayed five times with lime sulphur in the strength recommended for summer sprays for the apple.

In 1912 the early blight was most prevalent. In these tests it appeared that the sprays which were applied 3 and 5 times were not sufficient to control the early blight. The 7 spray treatment was most effective in controlling the disease. In this instance the application of two sprays after August 2 gave a net increase in marketable tubers of 32.5 bushels over the plots sprayed 5 times.

Some investigators have questioned the economy of spraying in regions where the late blight is not prevalent. The re-

sults of all these tests indicate that spraying from a standpoint of insect and disease control is profitable. In 1910 6 sprayings gave an increase of 61.56 bushels of marketable tubers over the check; in 1911, 5 sprayings gave an increased yield of 36.94 bushels, and in 1912, 7 sprayings increased the yield 33.6 bushels.

TABLE IV. SUMMARY OF SPRAYING TESTS.

No. of Sprays	1910			1911			1912		
	Total	Market	Culls	Total	Market	Culls	Total	Market	Culls
3	115.83	108.0	7.8	97.24	87.91	9.33	101.0	91.5	9.5
4	138.16	129.0	9.16						
5				109.68	103.84	5.83	104.4	96.1	8.3
6	160.0	151.66	8.33						
7				111.12	101.47	9.65	136.2	128.6	7.6
Lime sulphur 5 times							116.1	108.5	7.6
Check, lead arsenate only	95.5	90.1	5.4	74.80	66.90	7.90	98.8	95.0	3.8

TABLE V. AVERAGE NET INCREASE FROM SPRAYING.

No. of Sprays	Cost per acre 1 spraying	Total cost	Av. increase in bu. over check	Average price	Av. increase from spraying
3	$1.00	$3.00	11.80	$6.40	$3.20
5	1.00	5.00	25.64	13.92	8.92
7	1.00	7.00	43.22	23.46	16.46

If potatoes are to be grown profitably it is necessary to spray at least once or twice with an arsenical to control the insect pests.

In these tests the check plots were sprayed three times with lead arsenate, and in 1911 and 1912 four times. The cost of spraying with lead arsenate to combat insects amounts to about $0.75 per acre per spray. The extra cost of spraying with bordeaux, therefore, will be the cost of materials and time for preparation, which amounts to about $0.25 per acre per spray.

In the preceding table this factor is not considered. If it were the net returns from the bordeaux plots would be proportionately higher than from the check plots.

In spraying experiments carried on by Stewart* from 1904 to 1910 it was found that the average gain by spraying over not spraying in 205 experiments was 54.3 bushels per acre.

*Bul. 338, New York Experiment Station, Geneva, 1910.

TABLE VI. SHOWING FINANCIAL RETURNS FROM SPRAYING WITH BORDEAUX MIXTURE.

Marketable bushels per acre	No. Sprays	Cost of one spray per acre	Total cost	Increase in bushels over check	Cash Returns	Net increase from spraying
		1910—at 48c per bushel.*				
108.0	3	$1.00	$3.00	17.9	$8.59	$5.59
129.0	4	1.00	4.00	38.9	18.67	14.67
151.6	6	1.00	6.00	61.5	25.52	23.52
90.1	Lead arsenate only.					
		1911—at 71c per bushel.*				
87.91	3	$1.00	$3.00	21.01	$14.91	$11.91
103.84	5	1.00	5.00	36.94	26.22	21.22
101.47	7	1.00	7.00	34.57	25.25	22.25
66.90	Lead arsenate only.					
		1912—at 44c per bushel.*				
91.5	3	$1.00	$3.00	3.5	-$1.54	-$4.46
96.1	5	1.00	5.00	-1.1	.48	-4.52
128.6	7	1.00	7.00	33.6	14.78	7.78
95.0	Lead arsenate only.					

Lime-sulfur, as a substitute for bordeaux mixture in the spraying of potatoes, has been tested only to a limited extent. The New York Experiment station, in tests carried on in 1911**, reached the conclusion that "Lime-sulfur cannot replace bordeaux mixture as a preventative of potato diseases." A similar test made in 1912 strengthens this conclusion. "The lime-sulfur treatments caused dwarfing of the plants, as in 1911, did not repress but seemingly increased the damage from tip burn, did not keep off the flea beetles, apparently did not check the late blight and rot, and resulted in greatly decreased yields, as compared with rows sprayed with bordeaux mixture." In these tests the check rows yielded at the rate of 165 bushels marketable potatoes per acre, while the plots sprayed with lime-sulfur gave only 171 bushels per acre. Those sprayed with bordeaux gave a total marketable yield of 277.5 bushels per acre.

*Average price for potatoes in Iowa December 1, as given by Iowa Year Book, 1910-1911-1912.

**Bul. 347, New York Experiment Station, Geneva, 1911.

In the Iowa station tests with lime-sulfur, 5 applications were given, as indicated in table III. These plots out-yielded by 12.4 bushels the bordeaux plots to which 5 treatments were given.

However, in this case the Iowa station did not have such adverse conditions to contend with as those encountered in the New York experiment. There was no late blight, and consequently no rot. The insects were plentiful, especially the flea beetle, but the lime-sulfur and lead arsenate spray held them in check. In Iowa the vines which received the lime-sulfur treatment looked healthy and vigorous and there was practically no disease infection, whereas in the New York experiment there was much evidence of tip burning and stunting of the growth of the vines.

No positive conclusion can be drawn from the Iowa tests as to the merits of the two fungicides, until further investigations are completed.

TIME FOR SPRAYING.

It is well to begin spraying* when the vines are 6 to 8 inches high, which in the region of the Iowa Agricultural Experiment station at Ames is about the middle of June. If the season is wet, 6 or 7 sprays with bordeaux** should be given. Arsenates can be added for a sufficient number of applications to keep the insects in check.

POTATO VARIETY TESTS.

According to reports received by the Agricultural Extension department of the Iowa State College,*** forty-four growers reported their choice of early varieties of potatoes for planting in Iowa; 60 per cent of these favored the Early Ohio; and a few, White Ohio, Early Six Weeks, Early Rose and Red Triumph. Seventy-three growers gave their choice of late varieties; 41 per cent of these favored the Rural New Yorker; Harvest King stood second, and Carmen third. The Harvest King is without doubt the same variety as the Rural New Yorker, and, therefore, that variety is most planted in the state.

The fact that most of the commercial growers of the state were growing only two varieties of potatoes, one early and one late, made it important to compare them with several other

*The cost of spraying for each application, including cost of materials, labor and wear and tear on machinery, need not exceed $1.00 per acre.

**Directions for the preparation and use of bordeaux mixture are given in Iowa Agricultural Experiment Station Bulletin No. 127.

***Extension Bull. No. 8, Agricultural Extension Department, Iowa State College.

promising varieties. In selecting these other varieties for testing, letters were sent to the surrounding states asking for a recommended list for planting in those states. So far as possible the varieties recommended were secured and planted. A few of local importance were also included.

Nearly all of the varieties recommended were secured, but the seed of some proved not to be true to name, and they could not be secured. No report is therefore possible on several varieties that give much promise of becoming popular in the state. This report covers only three years' testing and several varieties which are promising should be tested further, not only by the station, but also by the growers in the potato districts of the state.

As nearly as possible, the seed used for testing the varieties in the following list was determined as true to name. This was done by comparing with descriptions from other states and by submitting to the Department of Agriculture at Washington for identification.

EARLY VARIETIES.

Early Acme: A light pink variety, medium in size, oval, somewhat elongated, and frequently narrowed toward the stem end,—eyes numerous, medium in size, shallow. This variety is very much like Early Ohio and matures at about the same time.

Clark's Seedling: White variety slightly tinged with pink, rather small to medium in size, oblong or oval in shape; eyes small, numerous, moderately deep; skin slightly netted.

Irish Cobbler: A white variety, of large size, roundish, shortened in shape,—eyes medium in size and number, fairly shallow. The surface is somewhat uneven.

Early Ohio: A pinkish variety, medium to large in size, elliptical in shape with smooth surface; eyes numerous, rather large, shallow to medium in depth.

White Ohio: A white variety with occasional tingeing of pink, medium in size, elliptical in form, somewhat elongated,—eyes numerous, medium in size and fairly shallow.

Early Six Weeks: A dark variety, brownish pink in color, small or medium in size, oval and slightly flattened in shape, fairly regular in form. The skin is smooth, with a few netted spots at one end.—eyes medium in size, shallow, though somewhat variable in character. Sometimes pink streaks in the flesh.

Early Rose: A pink variety, medium in size, cylindrical in shape, with smooth skin; eyes medium in size, shallow, pink.

Early Roser: A bluish white variety, tinged with brown, fairly uniform in color, medium in size, elongated kidney shaped, variable in form; skin slightly roughened to coarsely russetted or netted at seed end.

LATE VARIETIES.

American Wonder: A white, smooth variety of good size, rather elongated in form; eyes shallow.

Banner. A white variety, medium to large in size, elliptical, shortened in shape; eyes few, shallow, medium in size.

Burbank: A smooth, clear, white variety of large size, elongated, flattened, and not always regular in shape; eyes medium in number, medium in size, and well distributed, somewhat variable.

Carmen No. 3: A white variety, with slightly uneven surface, medium to large in size, oblong, short to medium in length, flattened; eyes medium in number and size, medium in depth to moderately deep.

Harvest King: Undoubtedly is Rural New Yorker. See description of Rural New Yorker.

Netted Gem: A white variety, heavily netted over entire surface, medium and uniform in size, oblong, slightly flattened and regular in form; eyes shallow to very shallow, small, same color as skin. This variety is highly recommended in irrigated districts of the west, but its record here has not proven it adapted to our conditions.

Norcross: A white variety, fairly smooth, medium to large in size, oblong, medium in length; eyes about medium in number and depth, large in size. A newer variety that gives promise.

Prosperity: A white variety, above medium in size, slightly elongated, rather broad and flattened, slightly pointed at stem end; skin russeted in patches, eyes medium shallow.

Pat's Choice: A pink variety, smooth, large in size, oblong, tapering in form; eyes few, small, shallow, very pink.

Rural New Yorker: Smooth, white variety, medium to large in size, oval, flattened in shape, fairly uniform; eyes few, large, shallow.

Sir Walter Raleigh: A white variety, with patches of russett, medium to large in size, roundish in form; eyes deep.

Swedish Rose: A reddish variety of large size, smooth, elongated; eyes prominent, broad and shallow; flesh white and slightly tinged with pink. This variety is of uncertain origin, and is grown by a few growers about Ames. It had given some promise before these tests. Its record at the Station will be noted in the following tables.

Other Varieties: Among the varieties tested which are not reported upon because of uncertainty in regard to their being true to name were the following: Early Varieties: Bovee, and Beauty of Hebron. Late Varieties: American Giant, Green Mountain, Ionia Seedling, Peerless, Vermont Gold Coin, and White Victor.

The following tables give the results of the variety tests. Attention is called to the fact that the yield is very low as compared to that secured by the commercial growers of the state. This is accounted for by the fact that the soil upon which our test plots were located was not adapted to potato culture, being a heavy black loam. The yield for 1911 is especially low. That season was very dry and, in addition, the potatoes were planted on soil which had grown potatoes the year previously. This was necessary, as no other land was available for the plots.

It is interesting to note that the Rural New Yorker and Harvest King stand second and third, respectively, in production of marketable tubers per acre in the three year average. As stated elsewhere, these varieties are undoubtedly the same, and there seems to be good reason for the fact that Rurals are planted in this state almost to the exclusion of other varieties for the main or late crop.

TABLE VII. THREE YEARS' YIELD OF EARLY VARIETIES OF POTATOES.

Variety	1910			1911			1912		
	Total	Marketable	Culls	Total	Marketable	Culls	Total	Marketable	Culls
Early Acme	87.75	61.88	25.87	91.60	58.37	33.23			
Clark's Seedling	118.79	99.18	19.61	93.84	46.79	47.05	73.00	53.10	19.90
Irish Cobbler	163.22	145.36	17.86	129.43	105.82	23.61	114.10	98.10	16.00
Early Ohio	132.16	92.11	40.05	117.73	85.50	32.23			
White Ohio	97.36	65.36	32.00	81.89	57.37	24.52			
Red River Six Weeks	109.57	80.97	28.60	97.07	65.96	31.11			
Early Rose	153.21	116.19	37.01	84.50	46.67	37.83	62.60	47.00	15.60
Early Roser	147.82	120.90	27.12	85.00	44.55	40.45	38.00	22.40	15.60

TABLE VIII. YIELD IN BUSHELS OF MARKETABLE TUBERS PER ACRE AND RANK FOR THREE YEARS. EARLY VARIETIES.

Variety	Average for 3 Years.		1910		1911		1912	
	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
Early Acme	60.12	8	61.88	8	58.37	4		
Clark's Seedling	66.36	5	99.18	4	46.79	6	53.10	2
Irish Cobbler	116.42	1	145.36	1	105.82	1	98.10	1
Early Ohio	88.80	2	92.11	5	85.50	2		
White Ohio	61.36	7	65.36	7	57.37	5		
Red River Six Weeks	73.46	3	80.97	6	65.96	3		
Early Rose	69.95	4	116.19	3	46.67	7	47.00	3
Early Roser	62.61	6	120.90	2	44.55	8	22.40	4

TABLE IX. THREE YEARS' YIELD IN BUSHELS PER ACRE LATE VARIETIES OF POTATOES.

Variety	1910			1911			1912		
	Total	Marketable	Culls	Total	Marketable	Culls	Total	Marketable	Culls
American Wonder	176.36	155.73	20.63	94.46	74.30	20.16	125.10	88.90	36.20
Banner				100.06	82.01	18.05	75.86	62.10	13.76
Burbank				70.69	35.22	35.47	180.60	138.80	41.80
Carmen No. 3	138.65	122.06	16.59	72.08	60.11	11.97	146.70	115.50	31.20
Harvest King	131.98	123.18	8.80	130.68	112.26	18.42	146.30	123.60	22.70
Netted Gem	130.57	98.52	32.05	74.05	58.12	15.93			
Norcross	164.81	145.20	19.61	115.74	94.09	21.65	79.90	72.20	6.90
Prosperity	199.70	180.60	19.10	116.24	102.92	13.32	151.30	114.10	37.20
Pat's Choice							119.10	95.00	24.10
Rural New Yorker	140.00	111.55	28.45	136.77	127.94	38.83	153.70	129.40	24.30
Sir Walter Raleigh	146.58	124.44	22.14	100.31	83.13	17.18	112.30	101.60	10.70
Swedish Rose	155.40	141.60	13.08	105.54	65.34	40.20	133.70	119.70	14.00

TABLE X. YIELD IN BUSHELS OF MARKETABLE TUBERS PER ACRE AND RANK FOR THREE YEARS. LATE VARIETIES.

Variety	Average for 3 Years.		1910		1911		1912	
	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
American Wonder	106.31	5	153.73	2	74.30	7	88.80	9
Banner	72.05	12			82.01	6	62.10	11
Burbank	87.01	10			35.22	11	138.80	1
Carmen No. 3	99.22	8	122.06	7	60.11	9	115.50	5
Harvest King	119.68	3	123.18	6	112.26	2	123.60	3
Netted Gem	78.32	11	98.52	9	58.12	10		
Norcross	103.83	6	145.20	3	94.09	4	72.20	10
Prosperity	122.54	1	180.60	1	102.92	3	114.10	6
Pat's Choice	95.00	9					95.00	8
Rural New Yorker	119.74	2	111.55	8	127.14	1	129.40	2
Sir Walter Raleigh	103.05	7	124.44	5	83.13	5	101.60	7
Swedish Rose	108.88	4	141.60	4	65.34	8	119.70	4

INFLUENCE OF SEED SELECTION ON YIELD OF RURAL NEW YORKER POTATOES.

In the variety tests an attempt was made to keep up the strain by seed selection. Each year when digging these variety plots the best ten hills were selected and seed therefrom saved for planting the next year. To secure a check upon this method of seed selection, an experiment was planned as follows:

In 1910 the best ten hills of Rural New Yorkers and the poorest ten hills, from the productive standpoint, were selected. These two lots of seed were planted side by side in 1911. At first it was planned to select the best and the poorest from both of the lots and thus have four plots the next year, but such progression meant the multiplication of plots beyond the possibility of caring for them properly and it was decided to drop the poorest hills from the best strain of seed. During the harvest season of 1912, the product of the poorest hills from the poorer strain was accidentally mixed with other tubers, so that no record was secured. However, the accompanying table is indicative of what seed selection will do for the potato grower.

Rural New Yorker Seed Planted 1910.

- 10 best hills selected 1910, planted 1911, yielded in 1911, 127.94 bu. per acre.
  - 10 best hills selected 1911, planted 1912, yielded in 1912, 129.4. bu. per acre.
  - 10 poorest hills not planted.
- 10 poorest hills selected 1910, planted 1911, yielded in 1911, 77.03 bu. per acre.
  - 10 best hills selected 1911, planted 1912, yielded in 1912, 81.3 bu. per acre.
  - 10 poorest hills data not accurante.

TABLE XI.

1911 yield from the 10 best hills of 1910 seed		1911 yield from the 10 poorest hills of 1910 seed		Increase Market Tubers Bushels per Acre
Bushels Per Acre		Bushels Per Acre		
Market	Total	Market	Total	
127.94	166.77	77.03	102.5	50.91
1912 yield from the 10 best hills of 1911 from the 10 best of 1910.		**1912 yield from the 10 best hills of 1911 from the 10 poorest of 1910.**		**Increase Marketable Tubers per Acre**
Bushels Per Acre		Bushels Per Acre		
Market	Total	Market	Total	
129.4	153.7	81.3	105.6	48.1

In making selections those hills which had an average number of well formed, medium sized tubers for the variety were selected. These hills could, as a rule, be chosen by the appearance of the vines, though this was not always true. This method of seed selection would prove profitable to the grower if he could set aside a small seed plot and select his next year's seed from it.

The results are striking in that the yield was increased 50 bushels by taking the best and poorest seed only one year. By taking the best seed from each of these lots of seed the strain with quality behind it still outyielded the poorest strain by nearly 50 bushels.

INFLUENCE OF PLANTING DATE UPON YIELD.

There is a great divergence of opinion among growers and scientific men regarding the time to plant potatoes for the main crop in order to secure highest yields. Different seasons vary so much that it is probably impossible to fix a period at which time it will be best to plant and expect the same results each year. It does seem possible, however, through experiments covering a long term of years, to approximate that period.

Experiments were planned during the spring of 1910 to cover a term of ten years. It was the intention to plant 1-10th acre plots in duplicate each week, beginning the last week in April and ending the second week in June. In 1912 1-20th acre plots were planted. As will be noted in table XII, the first planting in 1910 gave the highest yield. The plans were therefore changed in 1911, beginning the planting the second week in April, and these plans were carried out for 1911. Subsequent results would tend to show that the abnormally early spring of 1910 was probably responsible for the high yield from the early planting. These results are presented for what they are worth, with recognition that a three year experiment does not offer more than suggestions as to what results might be secured over a longer term of years.

It is the general custom in Iowa to plant potatoes soon after the corn planting season is past. The corn planting season, of course, varies, but a probable average period for planting would be the first two weeks in May for central Iowa. This makes the probable average planting date for potatoes from May 10 to May 25. Providing the station records for 1911 and 1912 are taken as a basis, it would seem that the period following corn planting would be about the proper time for planting potatoes.

The following charts will show the maximum and minimum temperatures, the rainfall and the yield secured from planting on successive dates. By studying these charts and tables closely one may draw some interesting conclusions, but it should be noted that these conclusions are only suggestive and are not to be taken as conclusive evidence upon the question. There is one very important factor which has not been taken into consideration in these tests up to the present time and that is the soil temperatures at and following each planting. Experiments are being planned at this station at the present time looking toward more accurate information along this line in addition to such data as are herewith presented.

TABLE XII. 1910 TESTS OF PLANTING TIME.

Plot	Date Planted	Marketable Bu. per Acre	Culls Bu. per Acre	Total Yield Bu. per Acre
I and VIII	April 27	119.1	12.35	131.4
II and IX	May 4	110.2	10.75	120.9
III and X	May 11	94.5	10.8	105.3
IV and XI	May 18	102.5	8.05	110.5
V and XII	May 25	70.87	4.95	75.82
VI and XIII	June 1	49.8	4.6	54.40
VII and XIV	June 15	74.8	6.76	81.60

TABLE XIII. 1911 TESTS OF PLANTING TIME.

101-111	April 11	46.17	8.80	54.67
102-112	April 18	54.08	9.79	63.87
103-113	April 25	84.60	11.97	96.58
104-114	May 2	83.35	8.53	91.89
105-115	May 9	88.46	10.51	98.97
106-116	May 16	92.85	12.10	104.95
107-117	May 23	95.88	13.37	109.18
108-118	May 30	70.61	7.98	78.60
109-119	June 6	70.01	7.79	77.80
110-120	June 13	60.32	5.47	65.79

TABLE XIV. 1912 TESTS OF PLANTING TIME.

1 and 9	April 25	99.4	6.1	105.5
2 and 10	May 2	127.7	7.8	135.5
3 and 11	May 9	91.9	4.4	96.3
4 and 12	May 16	154.1	6.3	160.4
5 and 13	May 23	148.7	6.7	155.4
6 and 14	May 30	126.9	8.7	135.6
7 and 15	June 7	62.8	4.3	67.1
8 and 16	June 14	48.9	4.9	53.8

There was a general decrease in yield for each planting after April 27 in 1910. But it will be noted that the planting May 18 out-yielded the planting made May 11. Also the planting made

June 15 out-yielded that made June 1. By glancing at chart I it will be noted that the planting made May 11 was followed by small rainfall and cooler weather, while the planting made May 18 was followed by warmer weather and had the benefit of the rainfall. The same conditions will be noted for the planting made June 1, which was followed by rain and cooler weather, while the planting June 15 was followed by much warmer weather and had the benefit of the rains preceding the planting. These observations are offered as are those to follow as suggestions only and are not given as the only explanation of the results secured.

In table XIII it will be noted that there is a general rise in production for each successive planting in 1911 until that made May 23 and then a general decline in production for successive plantings. There is one exception to this general increase and decrease. The planting made April 25 out-yielded that made May 2. By noting chart II it will be seen that the planting made April 25 was followed by medium temperature for the greater part of the week, while the planting May 2 was made when the temperature was comparatively very low and following a heavy rainfall for two or three days.

Table XIV shows the yields on the different plots for 1912. We find here the same general increase in yield in each planting until that made on May 16 and then a general decline. There is also one exception here, the planting made May 9 is below that made on either of the preceding plantings. Chart III shows that this planting was followed by cooler weather for nearly a week, accompanied by a very heavy rainfall on May 11.

In all these instances it would seem that where planting before June 15 is followed by very cool weather and rainfall, which usually accompany each other, a reduction in yield may be expected.

Should future experiments bear out this conclusion, practical use might be made of the information by noting the weather forecasts and avoid planting until after any predicted cooler weather might be past. Rainfall, if not followed by much cooler weather, would not apparently have any harmful effect upon production, but, on the contrary, would be a benefit.

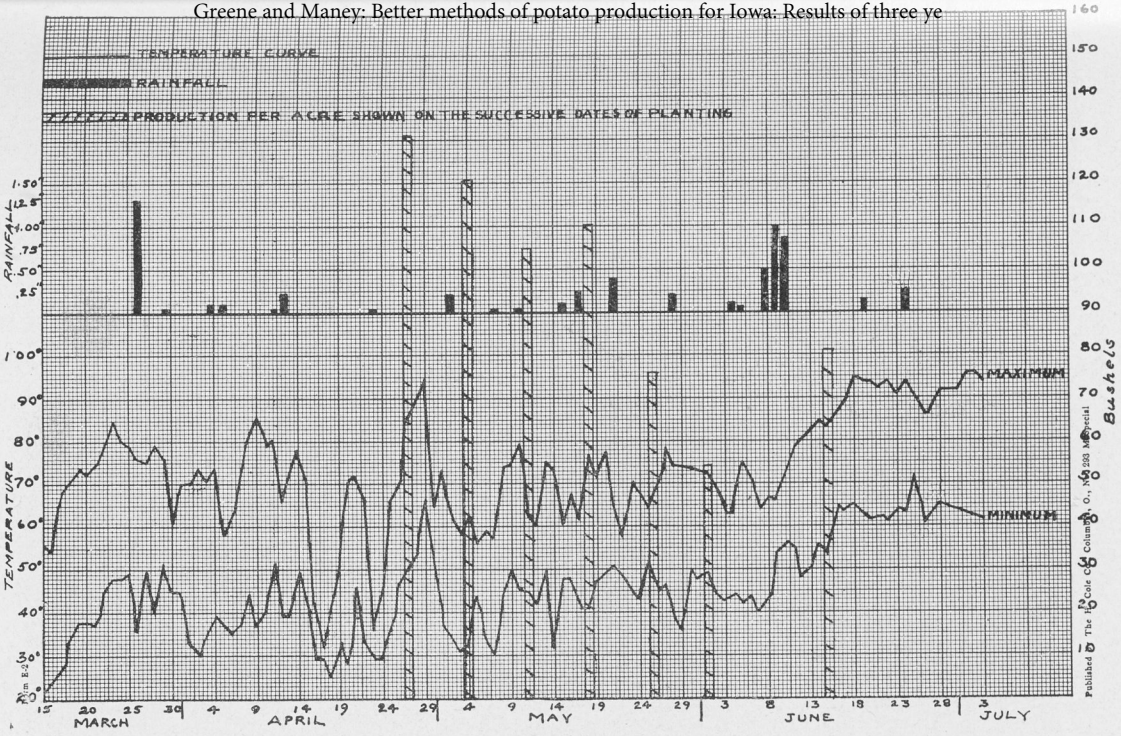
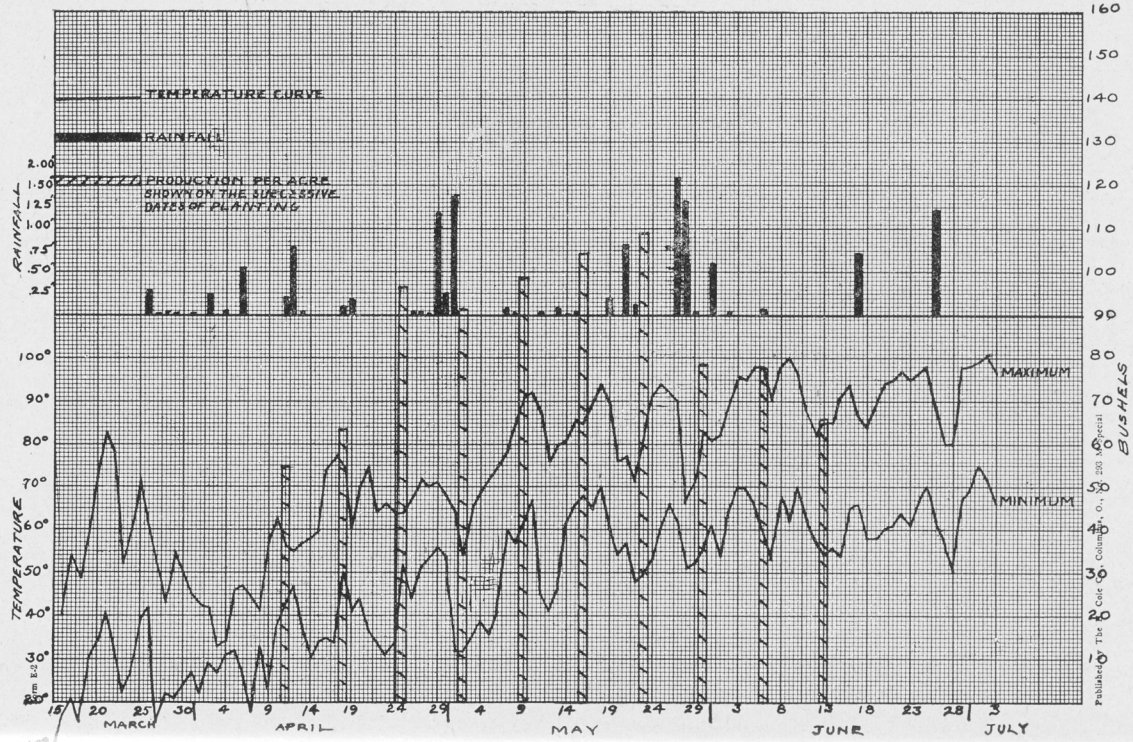

TEMPERATURE CURVE
RAINFALL
PRODUCTION PER ACRE SHOWN ON THE SUCCESSIVE DATES OF PLANTING
RAINFALL
TEMPERATURE
MAXIMUM
MINIMUM
Bushels
MARCH
APRIL
MAY
JUNE
JULY

CHART I—1910



80

CHART II—1911

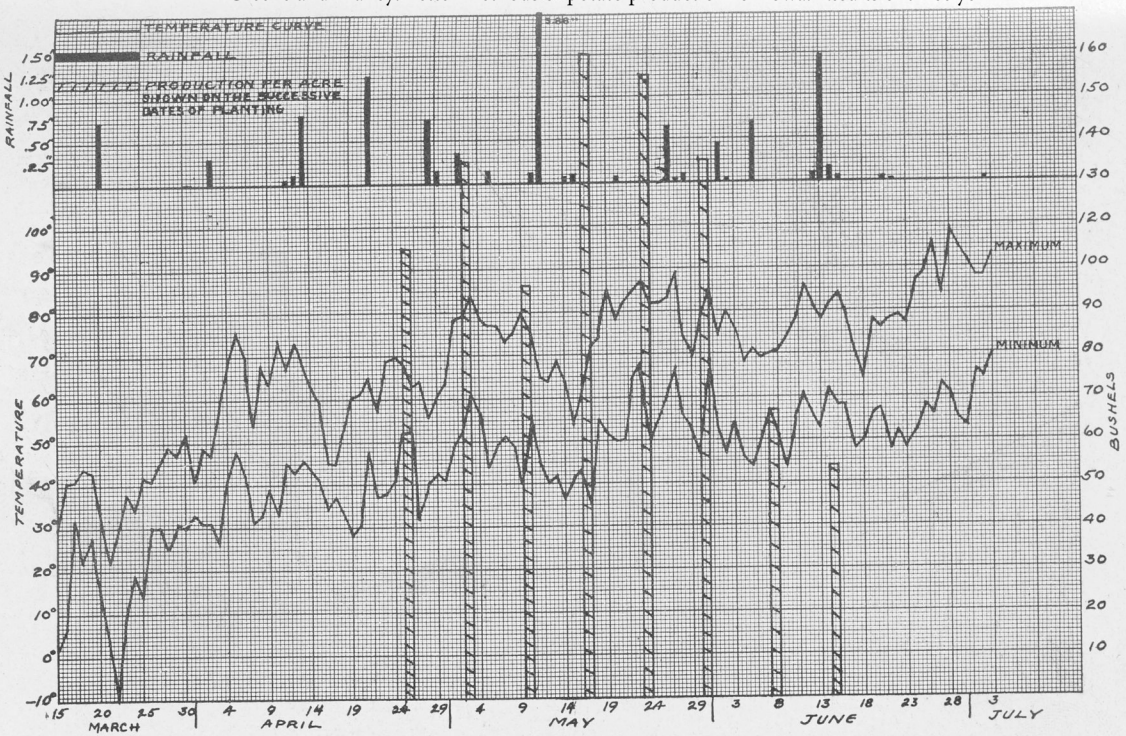


CHART III—1912